

EECS C145B / BioE C165 Spring 2003:
Problem Set V
Due May 8 2003

Please read the sections describing the rules for working in groups and the grading policy in the course introduction hand-out.

Problem 1 (25+25+15 points)

1. Many experts believe that all mammals get cancer. You are examining 100 “bumblebee bats” (*craseonycteris thonglongyai*), one of the smallest known mammals, for the presence of tumors. What modality would probably be the best to use and why? (In your answer consider, for example: resolution, sensitivity, contrast mechanism, practicality and cost)
2. What would be a good method for determining iron distribution in the animal’s brain? Why? Explain the contrast mechanism.
3. A colleague in a competing group is using small animal PET to study a slightly larger bat and is using a tracer labeled with ^{82}Rb . Should you follow your colleague’s lead? Why?

Problem 2 (40+40 points)

1. Derive an expression for the sensitivity of an ECT tomograph and compare the sensitivity of SPECT and PET for human brain imaging.

2. Compare the sensitivity and minimal resolvable feature size (at tomograph center and a few cm away from center) of the top-of-the-range MicroPET imager described at:

<http://www.cms-asic.com/Literature.pdf>

with the imager proposed in the paper:

<http://muti.lbl.gov/145b/LBNL-42562.pdf>

Explain the basis for your estimates and comparisons.

Problem 3 (50 points)

Complete the following problems in MRI Basics (in the reader):

1. 4-1 through 4-5. (reader p. 217)
2. 5-1 through 5-5. (reader p. 225)